

COURSE

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537.02

Mechanical and Experimental

8

PHILOSOPHY.

whereby any one, although unskill'd in Mathematical Sciences, may be able to understand all those *Phænomena* of Nature, which have been discovered by *Geometrical Principles*, or accounted for by *Experiments*; and Mathematicians may be diverted in seeing those *Machines* used, and *Physical Operations* perform'd, concerning which they have read.

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L. D. Chaplain to his Grace the Duke of
Sandwich, and F. R. S. at his House in Chan-
cel-Row, Westminster.



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1725.

This Course begins on Monday the
Day of the 8th of February at 6 in the Evening

R. 2334.

This Course consists of Two Parts.



IN the First are laid down the Principles of *MECHANICS*, and Laws of Motion, and the several Operations of Engines shewn.

IN the Second, the Nature of *FLUIDS* is explained, the Laws of *Hydrostatics* are rationally demonstrated, and its Paradoxes, or most surprising *Phænomena*, shewn, and experimentally accounted for.

The Third Part takes in the Properties of *AIR* and all the *Phænomena* which depend upon its Pressure and Elasticity; its Condensation and Rarefaction by Engines; the Manner how it is vitiated, and how purified; with great Variety of Experiments upon the *Air-Pump*.

The Fourth Part treats of *OPTICS*; considering, 1st, Direct Vision or Perspective, the Nature and Affections of Light. 2dly, Catoptrics, or Reflex Vision. 3dly, Dioptrics, or Refracted Vision; in which the Make of the Eye is consider'd; with the Faults of and Helps for bad Eyes. Lastly, Sir *Isaac Newton's* Theory of Light and Colours, prov'd by his Experiments, and confirm'd by some new ones, which may be done even by Candle-light.

N. B. *The Method of this Course is wholly Mathematical, viz. a Chain of Propositions proving each other; but, instead of Definitions, Axioms, and Postulata purely Geometrical, the Experiments made at the First Lesson prove the Precepts given at the Second, and so on: Things which otherwise would be merely speculative, being by this means rendered Objects of the Senses, and better understood in a Month or six Weeks, than in a Year's close Application to Books only.*

A Catalogue of the EXPERIMENTS made use of in the foregoing Course, to prove the Precepts

M E C H A N I C S.

CONCERNING Matter, its Extension and Divisibility, &c.

Of a *Vacuum*.

Experiments to prove a *Vacuum*.

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The universal Law of Gravitation explained.

The Law of Cohesion, or the Attraction of the small Parts of Bodies, deduced from the Ascent of Fluids in small Tubes, and between Glass Plates ; with Variety of other Experiments.

Both these distinguish'd from Electrical Attraction.

Experiments relating to Electrical Attraction and Repulsion.

The Electrical Phosphorus.

Mercurial Phosphorus.

Liquid Phosphorus.

Solid Phosphorus.

The Light of Phosphorus augmented in *Vacuo*, and diminish'd in compress'd Air.

Concerning Motion in general.

Experiments to distinguish Motion from Velocity.

Of Absolute and Relative Gravity.

Experiments to explain the Nature of, and to find the Center of Gravity in all Bodies, and to distinguish from the Center of Magnitude and Center of Motion.

The Experiment of the Double Cone rolling upwards by its own Gravity.

A Cylinder rolling upwards in the same manner, and a rolling Lamp.

A heavy Body, which of it self would fall from a Table, hinder'd from falling, by adding a heavier Body to it.

Experiments about the Falling, Sliding and Rolling of heavy Bodies.

Concerning the Distance and Line of Direction of a Weight and Power.

Experiments to shew the whole Mystery of the Feats done by *Sampsons*, or strong Men.

Of simple Machines.

Of Balances, which are either Scales or Still-yards.

Of the several Kinds of Levers.

Of Pulleys, single and combined.

Of the Wheel and Axle.

Of the Wedge.

Of the Screw.

Sails of Ships, Wind-mills, Water-mills, &c. explained on these Principles.

Experiments to shew how Men or Horses of unequal strength may be made to carry, or draw a Burden, in

proportion to their Strength.

A compound Engine, made up of all the simple Machines.

Experiments to shew the Advantage of great and small Wheels, according to different Circumstances in Coaches, Cars, &c.

Sir Isaac Newton's first Law of Motion demonstrated.

Experiments to shew that the Composition of Forces in several Directions, not contrary to each other, produces a new Direction in a Diagonal Line.

Some curious Experiments, made by a new Machine, for explaining the Composition of Forces.

An Experiment to shew that the Line of the Relative Ascent and Descent of a projected Body is the same, whether the Place from whence 'tis thrown be continually at rest, or in continual uniform Motion.

Objections against the Motion of the Earth, solved from this Principle.

The centripetal and centrifugal Forces of solid and fluid Bodies in Motion, explained and demonstrated by Experiments; with some surprizing Phenomena arising from those Forces.

Monf. *Des Cartes's* Vortices exploded.

Introduction to the Theory of Projectiles, and Motion of the Heavenly Bodies.

How a Body will move when its projectile Force either yields to, overcomes, or exactly balances that of Gravity.

Sir *Is. Newton's* second Law of Motion demonstrated.

An Experiment to shew that the Velocity of Falling Bodies is as the Times, and the Spaces gone through as the Squares of the Times of Falling.

The Force of resisting Mediums considered.

A curious Experiment to explain the Foundation of the Art of Gunnery.

The Nature of Fortification, explain'd from large and curious Models.

The Moon's Motion, explain'd from the Doctrine of Projectiles.

The Motion of the Planets and Comets, deduced from the same Principle.

The Solar System explain'd.

The Phases of the Moon, Tides and Eclipses, demonstrated.

Experiments with the Load-stone.

New

New Properties and Experiments of the same.

Experiments concerning the Descent of Bodies on inclined Planes ; being an Introduction to the Theory of Pendulums.

Experiments concerning Pendulums.

Center of Oscillation explain'd.

A Cycloid describ'd.

Cycloidal Checks for Pendulums.

The Motion of Pendulums alter'd by Heat and Cold.

Experiments to shew that the Motion of Waves in the Sea answers to the Motion of a Pendulum.

A curious Piece of Clock-work, which measures Time to the 16th Part of a Second ; very useful in Astronomical Observations.

Sir *Is. Newton's* Third Law of Motion demonstrated.

Flying and Swimming accounted for.

How to destroy the Elasticity of some Metals.

A curious Experiment concerning the tremulous Motion of sounding Bodies.

Experiments concerning the Laws of the Communication of Motion, in hard and elastick Bodies.

HYDROSTATICS.

CONCERNING Fluids in general.

Experiments to prove, that Fluids gravitate upon Fluids of the same Kind.

That Fluids of different Kinds gravitate upon each other.

That Fluids press in all Manner of Directions at the same time.

That the Quantity of that Pressure, in all Fluids, is proportional to the perpendicular Height of the Fluid, in all Parts of the containing Vessel.

That a Pint of Water may be made to press with as great a Force as several Gallons.

To raise any given Weight by the Force of a Man's Lungs only, provided he blows through a Hole proportionably small.

An Experiment of lifting a Weight by a Chain of inflated Bladders, applied to Muscular Motion.

Several other Experiments to explain the *Hydrostatical* Paradox.

Experiments to shew how high, and why Water will rise in Fountains and oblique Jets, and the best Way of making Spouting Pipes. Several

Several Sorts of curious Fountains.

The Expence of Water spouting from equal Holes, at any given Depth below the Surface, computed, and shewn to be as the Square Roots of those Depths.

The working of Syphons ; sucking, forcing and lifting Pumps, explain'd.

Experiments to shew the Fulminating of Water, rarified by Fire.

A Model of the Engine for raising Water by Fire.

Experiments to shew, that Bodies, heavier than Water, when weigh'd in Water, lose as much of their Weight, as is equal to their Bulk in Water ; and Bodies, lighter than Water, will so swim in it, that a Quantity of Water, equal in Bulk to the Part immers'd, will be equal in Weight to the whole Body.

That upon these Principles Lead, or any Metal, may be made to swim in Water, and even to be rais'd up by it.

That a Body, lighter than a Fluid, will be kept down, and even depress'd by it.

The Hydrometer, or Water Poise.

The Hydrostatical Balance, to determine the specific Gravity of all Solids and Fluids.

The Rising and Falling of Images and Glass Bubbles accounted for.

P N E U M A T I C S.

EXPERIMENTS concerning the Nature of Air, in general.

That the Density and Spring of the Air is as the Force that compresses it.

That the Pressure of the Air decreases, according to its Distance from the Surface of the Earth.

Cupping Glasses.

Artificial Lungs.

How to find what Quantity of Air presses upon our Bodies at any time.

The Diving Bell.

The Rising and Falling of the Quicksilver in the Weather-Glass, explain'd and accounted for.

The different Sorts of Barometers.

Thermometers and Hygrometers of several Kinds.

The Effect of high Winds on the Barometer, shewn by an artificial Storm.

The

The Air-Pump, and Manner of its Working, explain'd.
 Several Experiments, which directly prove the
 Weight, Pressure and Spring of the Air, by breaking
 Glass Phials by the Sense of Feeling, the *Phenomena*
 of Bladders, Glass Bubbles, &c. Fountains in *Vacuo*.

Barometers in *Vacuo*.

Experiments made in a condensing Engine.

An Experiment to shew, that as great Weight is
 required to draw two Brass Hemispheres asunder,
 when the Density of the Air on the Outside of them
 is doubled (though the Air between them be of the
 same Tenor with the common Air) as when there is
 a *Vacuum* made between them.

Another Experiment, shewing that if the Air, in
 the Vessel containing the said Hemispheres, be made
 three times more dense than the Air between them,
 they will require twice as much Weight to draw them
 asunder.

A Bottle broken by condensing the Air on the Out-
 side of it.

Experiments to prove that Sound can't be convey'd
 without Air; and that 'tis increased or diminished
 according as the Air is rarified or condensed.

The surprizing Motion of several sorts of Liquors in
Vacuo.

That Fire and Flame are fed by the Air.

That Gunpowder is fired in *Vacuo*, without any
 Explofion.

The Effects of rarified, condensed, and burnt Air,
 upon the Life of Animals.

With several other curious Experiments by the Air-
 Pump.

O P T I C S.

CONCERNING the Nature and Motion of Light.
 Of Vision in general.

How a Picture is the Representation of Objects.

Experiments proving the great Principle of Catop-
 trics, viz. That when Rays of Light are reflected,
 the Angle of Incidence is equal to that of Reflection.

Of Plane Mirrors.

The several Reflections from the two Surfaces of
 Looking-glasses consider'd.

Of

Of Concave and Convex Mirrors.

A Concave Cylindric Mirror.

A Picture optically deform'd, seen in just Proportion by Reflection from a Cylindric Mirror.

The Cause and Law of Refraction explain'd by Experiments.

How to measure the Refraction of any sort of Liquors.

Multiplying Glasses.

Experiments to shew the Nature of Convex and Concave Glasses, and the Manner of the Rays of Light passing through them, and uniting their Focus.

How to find the Focus of a Lens, and whether it be truly center'd.

Water made to burn, by collecting the Sun's Rays into a Focus.

The Camera Obscura.

The Magick Lanthorn.

The Diffraction of the Eye.

An Instrument to shew the Manner of Vision.

The Faults of Vision shew'd by an Instrument.

Experiments to shew how the short-sighted and old Eyes may be help'd.

Experiments to shew the Difference between Looking and Seeing.

Why Beams seem to dart from a Candle.

To make two Candles seem one.

To shew why both Eyes see things only single.

An Aerial Speculum.

The Nature, Use, and several Kinds of Microscopes and Telescopes.

A new and most curious Experiment to shew the Circulation of the Blood in the Lungs of a Frog.

An Experiment to measure the Refraction of the Air.

Sir Isaac Newton's Theory of Light and Colours proved by Experiments.

Experiments to shew the Cause of the Rain-bow.

The Charge of going through this Course is Three Guineas; One Guinea, is to be paid at the Time of Subscription, and the Remainder the first Day of the Course.

F I N I S